REMARKS

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Interview with the Examiner

Applicant wishes to thank the Examiner for her courtesy and helpful comments during the telephone interview of February 6, 2008. During this interview, the Examiner and her Primary Examiner kindly listened to Applicant's comments concerning the cited Ishii et al. reference. The Examiners agreed that this reference was not sufficient to remedy the deficiencies of the Herron et al. reference, as is discussed in detail below.

Claim Amendments

Claims 1 and 2 have been amended to include the use of an aprotic polar organic solvent. Support for these amendments is found on page 26, lines 16-19 of Applicant's specification.

Claims 4, 6 and 9 have been amended to clarify that the method for producing an aromatic caboxylic acid ester is carried out in one step. Support for these amendments is found on page 30, lines 21-24 of Applicant's specification.

New claims 10 and 11 have been added to the application, to recite that the oxidation of claims 1 and 2 is carried on in a presence of water and/ or polyol. Support for these claims is found on page 28, line 13 to page 29, line 5 of Applicant's specification.

No new matter has been added to the application by these amendments.

Patentability Arguments

The patentability of the present invention over the disclosures of the references relied upon by the Examiner in rejecting the claims will be apparent upon consideration of the following remarks.

Rejections Under 35 U.S.C. § 103(a)

Rejection of claims 1-3, 5, 7 and 8 based on Herron et al.

The rejection of claims 1-3, 5, 7 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Herron et al. (WO 02/16298) is respectfully traversed.

The Position of the Examiner

The Examiner takes the position that Herron et al. teach the oxidation of xylene to both 4-methyl benzaldehyde and toluic acid, under air pressure, using a supported gold catalyst, where the gold catalyst is in the form of elemental gold and metal particles on a solid support, in which Group VIII metals can also be used. The Examiner admits that Herron et al. fail to teach the use of oxygen molecules in the oxidation reaction. The Examiner takes the position that it is well known in the art that air, which contains oxygen, can be used for oxidation reactions in lieu of pure oxygen. The Examiner asserts that it would be obvious to one of ordinary skill in the art at the time of the invention, to use air instead of pure oxygen in the oxidation reaction for converting an aromatic compound to the corresponding aldehyde and carboxylic acid.

Applicant's Arguments

Initially, as discussed above, Applicant has amended independent claims 1 and 2 to include the use of an aprotic polar organic solvent. Herron et al. fail to teach or suggest the oxidation of an aromatic compound having an alkyl substituent in an aprotic polar organic solvent to produce an aromatic aldehyde compound, as recited in Applicant's amended claims.

Additionally, as discussed on page 1, lines 18-23 of Applicant's specification, "[c]onventional methods for producing aromatic aldehyde compounds, particularly methods for oxidizing aromatic compounds having an alkyl substituent with oxygen to give aromatic aldehydes, have been difficult to produce the aromatic aldehydes in high yield and in high selectivity." (Emphasis added). An important feature of Applicant's independent claims 1 and 2 is that the oxidation of an aromatic compound having an

alkyl substituent in an aprotic polar organic solvent stops at the stage of an aromatic aldehyde. Applicant notes that, although the selectivity of aromatic carboxylic acid is not always zero, the selectivity of the aromatic aldehyde is much higher than the selectivity of the aromatic carboxylic acid. On the contrary, in Example 13 of the Herron et al. reference, which is relied upon by the Examiner in the rejection, the yield of toluic acid is more than twice the yield of 4-methylbenzaldehyde. (See Table 1 on page 13 of the reference.)

The use of an aprotic polar organic solvent in the oxidation of an aromatic compound having an alkyl substituent to an aromatic aldehyde compound makes it possible to increase the yield and selectivity of the aromatic aldehyde compound. Herron et al. fail to teach or suggest such an unexpected advantageous effect attained by the use of an aprotic polar organic solvent. In fact, Example 13 of the reference employs acetic acid. Page 27, line 21 to page 28, line 3 of Applicant's specification states, "[b]y the use of a non-aprotic solvent, that is a solvent which has polarity but is protonic, such as acetic acid and methanol, the aromatic compound having an alkyl substituent as the starting material is oxidized into an aromatic carboxylic acid or an aromatic carboxylic acid ester, so that the selectivity of the desired aromatic aldehyde compound has a tendency to become decreased." (Emphasis added.)

By comparing the yields described in Applicant's specification and in Table 1 of the Herron et al. reference, it is clear that aromatic aldehyde compounds can be obtained in higher yields by the method of the presently claimed invention, as compared to the method of Herron et al. (Please note that yield is equal to a product of conversion and selectivity.)

For example, Experimental Examples 1 and 2 of Applicant's specification (pages 42-43) disclose a conversion of starting material of 67% and 46%, and a selectivity to aldehyde as the desired product of 65% and 75%, respectively. On the contrary, Table 1 of the Herron et al. reference discloses a conversion rate of 36.2% with 1% Au on TiO_2 as the catalyst, and only 4% of the resulting product is 4-methyl-benzaldehyde. Further, Table 1 of the reference discloses a conversion rate of 9.8% with 1% Au on alpha-alumina as the catalyst, and only 6% of the resulting product is 4-methyl-benzaldehyde.

Thus, it is clear that Applicant's claimed method provides superior results when compared to the process of Herron et al. Specifically, Applicant's claimed method results in a superior yield of the desired aromatic aldehyde compound when compared to the teachings of the cited reference. Therefore, independent claims 1 and 2, as well as dependent claims 3, 5, 7 and 8 are not obvious based upon the teachings of Herron et al.

Regarding new claims 10 and 11, Herron et al. fail to teach or suggest the oxidation of an aromatic compound having an alkyl substituent in a presence of water and/ or a polyol. The presence of water and/ or a polyol as components in the reaction make it possible to improve activity and selectivity. Herron et al. further fail to teach or suggest such an unexpected advantageous effect attained by the presence of water and/ or a polyol. Therefore, new claims 10 and 11 are not obvious based upon the teachings of Herron et al.

For the above reasons, the subject matter of Applicant's claims 1-3, 5, 7 and 8, and new claims 10 and 11, is clearly patentable over the Herron et al. reference.

Rejection of claims 1-9 based on Herron et al. in view of Ishii et al.

The rejection of claim 1-9 under 35 U.S.C. 103(a) as being unpatentable over Herron et al. in view if Ishii et al. is respectfully traversed.

The Position of the Examiner

The Examiner relies upon Herron et al. for the reasons stated above. The Examiner admits that Herron et al. fail to teach the further conversion of the aromatic aldehyde with a primary alcohol to the aromatic carboxylic acid ester. The Examiner relies upon Ishii et al. as teaching the oxidation of an aromatic aldehyde, using a primary alcohol as the solvent, to give the corresponding aromatic carboxylic acid ester.

Applicant's Arguments

Herron et al. fail to teach or suggest the subject matter of claims 1-3, 5, 7, 8, 10 and 11 for the reasons set forth above.

Regarding claims 4, 6 and 9, in the method for producing an aromatic carboxylic acid ester according to the presently claimed invention, an aromatic compound having an alkyl substituent is converted into an aromatic carboxylic acid ester in one process step by use of a primary alcohol as a reaction solvent. (Please see page 31, lines 12-19 of Applicant's specification.) As discussed previously, claims 4, 6 and 9 have been amended to more clearly set forth that the reaction is carried out in one process step. Herron et al. fail to teach or suggest the oxidation of an aromatic compound having an alkyl substituent in a primary alcohol to produce an ester of an aromatic carboxylic acid with the primary alcohol. Therefore, independent claims 4, 6 and 9 are not obvious based upon the teachings of Herron et al.

Regarding the Ishii et al. reference, the Examiner points to column 29, line 2 of the reference, and asserts that this passage teaches oxidation to produce an aromatic carboxylic acid ester by the addition of a primary alcohol. However, after carefully reviewing the Ishii et al. reference, it is clear that the discussion at column 29 is referring to an example of a substrate to be oxidized, with "(e) conjugate compound" being a specific example. Accordingly, the passage relied upon by the Examiner as teaching "methanol and ethanol" is only stating that the use of a protonic solvent as a reaction solvent in the oxidation of α,β-unsatured nitrile, α,β-unsaturated carboxylic acid or its derivative may sometimes provide a diol derivative inclusive of an acetal or acyloxy compound.

Thus, the process of Ishii et al. is useful for producing an oxide by oxidation with air or oxygen of a corresponding conjugate compound, for example, the production of an alkenediol from a corresponding conjugate diene, or for the production of compounds (3a) and (3b) form the α,β-unsaturated nitrile or α,β-unsaturated carboxylic acid or its derivative. (Please see column 28, line 63 to column 29, line 26 of the reference.)

Thus, contrary to the Examiner's assertion, Ishii et al. fail to teach or suggest the use of a primary alcohol as a reaction solvent in the oxidation of an aromatic aldehyde having an alkyl group to produce the corresponding aromatic carboxylic acid ester. This position was discussed during the telephone interview with the Examiner. The Examiner agreed with Applicant that the Ishii et al. reference does not remedy the deficiencies of

the Herron et al. reference, as indicated in the Interview Summary form, mailed February 27, 2008.

For these reasons, the subject matter of Applicant's claims 1-9, and new claims 10 and 11, is clearly patentable over the teachings of Herron et al. in view of Ishii et al.

Conclusion

Therefore, in view of the foregoing amendments and remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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